

REMARKS

Claim Rejections under 35 U.S.C. § 102 (b)

Claims 10-12

The Examiner has rejected claims 10-12 under 35 U.S.C. § 102 (b) as being anticipated by Sugita et al. (EP 0915384).

Applicant respectfully disagrees with the Examiner. Applicant has amended claim 10. Support is provided in the specification including at paragraphs [0024], [0055], [0060], and [0068].

Claim 10, as amended, of Applicant's claimed invention, claims a method comprising: method comprising: forming an interference pattern of alternating non-exposed lines and exposed spaces on a photoresist, the lines being continuous and having a first width; aligning features indirectly to a previous layer pattern instead of to the alternating lines and spaces; and exposing a portion of at least one line without a mask to radiation to form the features with a second width, the second width being less than the first width. See Figure 2 and Figure 3B.

However, Sugita et al. fails to teach forming an interference pattern of lines with a first width, aligning indirectly to a previous layer pattern instead of to the lines, and forming without a mask features with a second width that is narrower than the first width. See Figures 11A-11D.

Thus, Sugita et al. fails to teach each and every element of the claimed invention, as claimed in claim 10, and therefore fails to anticipate the claimed invention, as claimed in claim 10.

Claims 11-12 are dependent on claim 10.

Consequently, Sugita et al. also fails to teach each and every element of the claimed invention, as claimed in claims 11-12, and therefore fails to anticipate the claimed invention, as claimed in claims 11-12.

In view of the foregoing, Applicant respectfully requests the Examiner to withdraw the rejections under 35 U.S.C. § 102 (b) to claims 10-12.

Claim Rejections under 35 U.S.C. § 103 (a)

Claims 1-3, 5, 7, and 25-27

The Examiner has rejected claims 1-3, 5, 7, and 25-27 under 35 U.S.C. § 103 (a) as being unpatentable over Sugita et al. (EP 0915384) in view of Brueck et al. (U.S. Patent 5,415,835).

Claims 1-3, 5, 7

Applicant respectfully disagrees with the Examiner. Applicant has amended claim 1-3, 5, and 7. Support is provided in the specification including at paragraphs [0024], 0055], [0060], and [0068].

Claim 1, as amended, of Applicant's claimed invention, claims a system comprising: system comprising: a first interference apparatus (510) to form a pattern of alternating lines and spaces on a photoresist, the lines being continuous and

having a first width and remaining unexposed to radiation, the spaces being exposed to radiation, the first apparatus comprising: a radiation source (520) with a pre-determined exposure wavelength, a collimated and expanded laser beam, a light-splitting element (525), and interfering beams; and a second maskless patterning apparatus (515) to expose selected areas of the photoresist, the selected areas to preserve the first width, narrow the first width, or break a continuity of portions of the lines; and an indirect alignment apparatus to align the selected areas exposed by the second maskless patterning apparatus to a previous layer pattern instead of with the lines and spaces in the pattern formed by the first interference apparatus. See Figures 1A, 2, 3B, and 5.

However, Sugita et al. fails to teach a system with a first interference apparatus, an indirect alignment apparatus, and a second maskless apparatus to form lines with a first width, align to the lines, and form features with a second width that is narrower than the first width. See Figures 11A-11D.

Brueck et al. also fails to teach a system with a first interference apparatus, an indirect alignment apparatus, and a second maskless apparatus to expose selected areas of alternating lines and spaces to preserve a width, narrow a width, or break continuity of portions of the lines.

Thus, a combination of the system of Sugita et al. and the system of Brueck et al., even if possible, will still not produce the system of Applicant's claimed invention, as claimed in claim 1. Therefore, Sugita et al. and Brueck et al., whether individually or collectively, fail to teach, suggest, or render obvious the system of Applicant's claimed invention, as claimed in claim 1, to one of ordinary skill in the art of lithography at the time that the invention was made.

Claims 2-3, 5, and 7 are dependent on claim 1. Thus, a combination of the system of Sugita et al. and the system of Brueck et al., even if possible, will still also not produce the system of Applicant's claimed invention, as claimed in claims 2-3, 5, and 7. Therefore, Sugita et al. and Brueck et al., whether individually or collectively,

also fail to teach, suggest, or render obvious the system of Applicant's claimed invention, as claimed in claims 2-3, 5, and 7, to one of ordinary skill in the art of lithography at the time that the invention was made.

In view of the foregoing, Applicant respectfully requests the Examiner to withdraw the rejections under 35 U.S.C. § 102 (b) to claims 1-3, 5, and 7.

Claims 25-27

Applicant respectfully disagrees with the Examiner. Applicant has amended claim 25. Support is provided in the specification including at paragraphs [0024], [0055], [0060], and [0068].

Claim 25, as amended, of Applicant's claimed invention claims a method comprising: using a first lithography process to expose an interference pattern of alternating non-exposed lines and exposed spaces on a photoresist with a first exposure having a first pitch; aligning indirectly to a previous layer pattern instead of with the interference pattern of alternating lines and spaces; and using a second maskless lithography process to trim and narrow a width of at least some of the non-exposed lines by exposing portions of the non-exposed lines with a second exposure having a second pitch, wherein the second pitch is different from the first pitch. See Figure 2 and Figure 3B.

However, Sugita et al. fails to teach a method to form an interference pattern with lines with a first width, align indirectly to a previous layer pattern instead of with the lines, and form, without a mask, features with a second width that is narrower than the first width. See Figures 11A-11D.

Brueck et al. also fails to teach a method to form an interference pattern with lines with a first width, align indirectly to a previous layer pattern instead of with

the lines, and form, without a mask, features with a second width that is narrower than the first width.

Thus, a combination of the method of Sugita et al. and the method of Brueck et al., even if possible, will still not produce the method of Applicant's claimed invention, as claimed in claim 25. Therefore, Sugita et al. and Brueck et al., whether individually or collectively, fail to teach, suggest, or render obvious the method of Applicant's claimed invention, as claimed in claim 25, to one of ordinary skill in the art of lithography at the time that the invention was made.

Claims 26-27 are dependent on claim 25. Thus, a combination of the method of Sugita et al. and the method of Brueck et al., even if possible, will still also not produce the method of Applicant's claimed invention, as claimed in claims 26-27. Therefore, Sugita et al. and Brueck et al., whether individually or collectively, also fail to teach, suggest, or render obvious the method of Applicant's claimed invention, as claimed in claims 26-27, to one of ordinary skill in the art of lithography at the time that the invention was made.

In view of the foregoing, Applicant respectfully requests the Examiner to withdraw the rejections under 35 U.S.C. § 102 (b) to claims 25-27.

Claim Rejections under 35 U.S.C. § 103 (a)

Claim 4

The Examiner has rejected claim 4 under 35 U.S.C. § 103 (a) as being unpatentable over Sugita et al. (EP 0915384) in view of Brueck et al. (U.S. Patent 5,415,835) as applied to claims 1-3, 5, 7, 10-12, 25-27 above, and further in view of Hsu et al. (U.S. Patent Application No. 2005/0028129).

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Applicant respectfully disagrees with the Examiner. Claim 4 is dependent on claim 1. Applicant has amended claims 1 and 4. Support is provided in the specification including at paragraphs [0024], [0055], [0060], and [0068].

Claim 1, as amended, of Applicant's claimed invention, claims a system comprising: system comprising: a first interference apparatus (510) to form a pattern of alternating lines and spaces on a photoresist, the lines being continuous and having a first width and remaining unexposed to radiation, the spaces being exposed to radiation, the first apparatus comprising: a radiation source (520) with a pre-determined exposure wavelength, a collimated and expanded laser beam, a light-splitting element (525), and interfering beams; and a second maskless patterning apparatus (515) to expose selected areas of the photoresist, the selected areas to preserve the first width, narrow the first width, or break a continuity of portions of the lines; and an indirect alignment apparatus to align the selected areas exposed by the second maskless patterning apparatus to a previous layer pattern instead of with the lines and spaces in the pattern formed by the first interference apparatus. See Figures 1A, 2, 3B, and 5.

However, Sugita et al. fails to teach a system with a first interference apparatus, an indirect alignment apparatus, and a second maskless apparatus to form lines with a first width, align to the lines, and form features with a second width that is narrower than the first width. See Figures 11A-11D.

Brueck et al. also fails to teach a system with a first interference apparatus, an indirect alignment apparatus, and a second maskless apparatus to expose selected areas of alternating lines and spaces to preserve a width, narrow a width, or break continuity of portions of the lines.

Hsu et al. teaches optical proximity correction (OPC).

Thus, a combination of the system of Sugita et al., the system of Brueck et al., and the system of Hsu et al., even if possible, will still not produce the system of

Applicant's claimed invention, as claimed in claim 1. Therefore, Sugita et al., Brueck et al., and Hsu et al., whether individually or collectively, fail to teach, suggest, or render obvious the system of Applicant's claimed invention, as claimed in claim 1, to one of ordinary skill in the art of lithography at the time that the invention as made.

Claim 4 is dependent on claim 1. Thus, a combination of the system of Sugita et al., the system of Brueck et al., and the system of Hsu et al., even if possible, will still also not produce the system of Applicant's claimed invention, as claimed in claim 4. Therefore, Sugita et al., Brueck et al., and Hsu et al., whether individually or collectively, also fail to teach, suggest, or render obvious the system of Applicant's claimed invention, as claimed in claim 4 to one of ordinary skill in the art of lithography at the time that the invention as made.

In view of the foregoing, Applicant respectfully requests the Examiner to withdraw the rejections under 35 U.S.C. § 102 (b) to claim 4.

Claim 6

The Examiner has rejected claim 6 under 35 U.S.C. § 103 (a) as being unpatentable over Sugita et al. (EP 0915384) in view of Brueck et al. (U.S. Patent 5,415,835) as applied to claims 1-3, 5, 7, 10-12, 25-27 above, and further in view of Saito et al. (U.S. 6,946,666).

Applicant respectfully disagrees with the Examiner. Claim 6 is dependent on claim 1. Applicant has amended claims 1 and 6. Support is provided in the specification including at paragraphs [0024], 0055], [0060], and [0068].

Claim 1, as amended, of Applicant's claimed invention, claims a system comprising: system comprising: a first interference apparatus (510) to form a pattern

of alternating lines and spaces on a photoresist, the lines being continuous and having a first width and remaining unexposed to radiation, the spaces being exposed to radiation, the first apparatus comprising: a radiation source (520) with a pre-determined exposure wavelength, a collimated and expanded laser beam, a light-splitting element (525), and interfering beams; and a second maskless patterning apparatus (515) to expose selected areas of the photoresist, the selected areas to preserve the first width, narrow the first width, or break a continuity of portions of the lines; and an indirect alignment apparatus to align the selected areas exposed by the second maskless patterning apparatus to a previous layer pattern instead of with the lines and spaces in the pattern formed by the first interference apparatus. See Figures 1A, 2, 3B, and 5.

However, Sugita et al. fails to teach a system with a first interference apparatus, an indirect alignment apparatus, and a second maskless apparatus to form lines with a first width, align to the lines, and form features with a second width that is narrower than the first width. See Figures 11A-11D.

Brueck et al. also fails to teach a system with a first interference apparatus, an indirect alignment apparatus, and a second maskless apparatus to expose selected areas of alternating lines and spaces to preserve a width, narrow a width, or break continuity of portions of the lines.

Saito et al. teaches a diffraction grating.

Thus, a combination of the system of Sugita et al., the system of Brueck et al., and the system of Saito et al., even if possible, will still not produce the system of Applicant's claimed invention, as claimed in claim 1. Therefore, Sugita et al., Brueck et al., and Saito et al., whether individually or collectively, fail to teach, suggest, or render obvious the system of Applicant's claimed invention, as claimed in claim 1, to one of ordinary skill in the art of lithography at the time that the invention as made.

Claim 6 is dependent on claim 1. Thus, a combination of the system of Sugita et al., the system of Brueck et al., and the system of Saito et al., even if possible, will still also not produce the system of Applicant's claimed invention, as claimed in claim 6. Therefore, Sugita et al., Brueck et al., and Saito et al., whether individually or collectively, also fail to teach, suggest, or render obvious the system of Applicant's claimed invention, as claimed in claim 6 to one of ordinary skill in the art of lithography at the time that the invention was made.

In view of the foregoing, Applicant respectfully requests the Examiner to withdraw the rejections under 35 U.S.C. § 102 (b) to claim 6.

Claims 8-9

The Examiner has rejected claims 8-9 under 35 U.S.C. § 103 (a) as being unpatentable over Sugita et al. (EP 0915384) in view of Brueck et al. (U.S. Patent 5,415,835) as applied to claims 1-3, 5, 7, 10-12, 25-27 above, and further in view of Tsuo et al. (U.S. 5,041,361).

Applicant respectfully disagrees with the Examiner. Claims 8-9 are dependent on claim 1. Applicant has amended claims 1, 8, and 9. Support is provided in the specification including at paragraphs [0024], [0055], [0060], and [0068].

Claim 1, as amended, of Applicant's claimed invention, claims a system comprising: system comprising: a first interference apparatus (510) to form a pattern of alternating lines and spaces on a photoresist, the lines being continuous and having a first width and remaining unexposed to radiation, the spaces being exposed to radiation, the first apparatus comprising: a radiation source (520) with a pre-determined exposure wavelength, a collimated and expanded laser beam, a

light-splitting element (525), and interfering beams; and a second maskless patterning apparatus (515) to expose selected areas of the photoresist, the selected areas to preserve the first width, narrow the first width, or break a continuity of portions of the lines; and an indirect alignment apparatus to align the selected areas exposed by the second maskless patterning apparatus to a previous layer pattern instead of with the lines and spaces in the pattern formed by the first interference apparatus. See Figures 1A, 2, 3B, and 5.

However, Sugita et al. fails to teach a system with a first interference apparatus, an indirect alignment apparatus, and a second maskless apparatus to form lines with a first width, align to the lines, and form features with a second width that is narrower than the first width. See Figures 11A-11D.

Brueck et al. also fails to teach a system with a first interference apparatus, an indirect alignment apparatus, and a second maskless apparatus to expose selected areas of alternating lines and spaces to preserve a width, narrow a width, or break continuity of portions of the lines.

Tsuo et al. teaches various exposure modules.

Thus, a combination of the system of Sugita et al., the system of Brueck et al., and the system of Tsuo et al., even if possible, will still not produce the system of Applicant's claimed invention, as claimed in claim 1. Therefore, Sugita et al., Brueck et al., and Tsuo et al., whether individually or collectively, fail to teach, suggest, or render obvious the system of Applicant's claimed invention, as claimed in claim 1, to one of ordinary skill in the art of lithography at the time that the invention as made.

Claims 8-9 are dependent on claim 1. Thus, a combination of the system of Sugita et al., the system of Brueck et al., and the system of Tsuo et al., even if possible, will still also not produce the system of Applicant's claimed invention, as claimed in claims 8-9. Therefore, Sugita et al., Brueck et al., and Tsuo et al., whether individually or collectively, also fail to teach, suggest, or render obvious the system

of Applicant's claimed invention, as claimed in claims 8-9 to one of ordinary skill in the art of lithography at the time that the invention was made.

In view of the foregoing, Applicant respectfully requests the Examiner to withdraw the rejections under 35 U.S.C. § 102 (b) to claims 8-9.

Claim 13

The Examiner has rejected claim 13 under 35 U.S.C. § 103 (a) as being unpatentable over Sugita et al. (EP 0915384) in view of Palmer et al. (U.S. Patent Application Publication No. 2002/0078427).

Applicant respectfully disagrees with the Examiner. Claim 13 is dependent on claim 10. Applicant has amended claim 10. Support is provided in the specification including at paragraphs [0024], [0055], [0060], and [0068].

Claim 10, as amended, of Applicant's claimed invention, claims a method comprising: method comprising: forming an interference pattern of alternating non-exposed lines and exposed spaces on a photoresist, the lines being continuous and having a first width; aligning features indirectly to a previous layer pattern instead of to the alternating lines and spaces; and exposing a portion of at least one line without a mask to radiation to form the features with a second width, the second width being less than the first width. See Figure 2 and Figure 3B.

However, Sugita et al. fails to teach forming an interference pattern of lines with a first width, aligning indirectly to a previous layer pattern instead of to the lines, and forming without a mask features with a second width that is narrower than the first width. See Figures 11A-11D.

Palmer et al. teaches a Boolean operation.

Thus, a combination of the method of Sugita et al. and the method of Palmer et al., even if possible, will still not produce the system of Applicant's claimed invention, as claimed in claim 10. Therefore, Sugita et al. and Palmer et al., whether individually or collectively, fail to teach, suggest, or render obvious the system of Applicant's claimed invention, as claimed in claim 10, to one of ordinary skill in the art of lithography at the time that the invention as made.

Claim 13 is dependent on claim 10. Thus, a combination of the system of Sugita et al. and the system of Palmer et al., even if possible, will still also not produce the system of Applicant's claimed invention, as claimed in claim 13. Therefore, Sugita et al. and Palmer et al., whether individually or collectively, also fail to teach, suggest, or render obvious the system of Applicant's claimed invention, as claimed in claim 13 to one of ordinary skill in the art of lithography at the time that the invention as made.

In view of the foregoing, Applicant respectfully requests the Examiner to withdraw the rejections under 35 U.S.C. § 102 (b) to claim 13.

Conclusion

Applicant believes that all claims pending, including claims 1-13 and 25-27, are now in condition for allowance so such action is earnestly solicited at the earliest possible date.

Pursuant to 37 C.F.R. § 1.136 (a) (3), Applicant hereby requests and authorizes the U.S. Patent and Trademark Office to treat any concurrent or future reply that requires a petition for extension of time as incorporating a petition for extension of time for the appropriate length of time.

Should there be any additional charge or fee, including extension of time fees and fees under 37 C.F.R. § 1.16 and § 1.17, please charge Deposit Account No. 50-0221.

If a telephone interview would in any way expedite the prosecution of this application, the Examiner is invited to contact the undersigned at (408) 653-7897.

Respectfully submitted,
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